UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
RANGE RESEARCH

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BRANCH OF RESEARCH

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APPALACHIAN FOREST EXPERIMENT STATION

A Proposed Experimental Forest in West Virginia

An inventory of the growing stock has been made on Elk Lick Run, proposed experimental forest in northeastern West Virginia.

The Elk Lick Run watershed takes in about 3,600 acres. It was cut over during the years 1904-11 and in general supports vigorous second growth with varying numbers of hold-overs. The species are for the most part characteristically northern, though some slopes and ridges support the southern upland hardwoods which are found prevailing over large areas further south.

From the standpoint of area covered the most important reproduction types are northern hardwoods, consisting largely of northern red oak, basswood, beech, sugar maple, ash, hickory, and black cherry, and a type having over 20 yellow poplar to the acre in mixture with the above mentioned species. Each of these types covers approximately one-third of the watershed, though in more or less scattered units. Stands tallying over 50 per cent yellow poplar cover 5 per cent of the area and are largely scattered along the main stream. Near the headwaters are two good sized areas running heavily to black cherry in mixture with northern red oak and sugar maple. Of the dry site types, the chestnut oak-red oak-black locust mixture is the most extensive. On a few small areas white and scarlet oak are abundant, usually with black locust and some chestnut oak.

Most of the larger chestnut has been removed, but on some of the drier sites there are dense stands of small dead sprouts. Fires have never been numerous and during recent years practically absent. Over portions of the eastern half of the valley, rhododendron forms a dense understory. On small but frequent patches of the western half, grape vines have pulled down everything up to pole size within their grasp and constitute a real menace to growth.

Forest Management in North Georgia

During November the Georgia party completed establishment of the yellow poplar quadrat frames and the sowing of one thousand seed in each 5x5 link frame. Three types of seed bed treatment and a check are being used. Each type of treatment is duplicated four times under the Latin square plan. A barbed wire fence was placed around the quadrats and a chain-wide fire line burned around the area.

An extensive reconnaissance of 2,400 acres on the Cherokee National Forest was begun. The survey will indicate the suitability of all or part of this area for experimental forest purposes. Ranger Arthur Woody helped the party in locating land lines.

Forest Management on the Coastal Plain

The third annual reexamination of the selective logging permanent sample plots at Franklin, Virginia, was completed during the month. The loblolly pine reproduction on these plots seems to be quite sparse and

spotted. The hardwood reproduction, particularly the sprout growth, is quite dense, in some places running as high as 170,000 stems per acre. The lack of loblolly pine reproduction and the presence of a heavy stand of hardwood reproduction offers a problem if the next stand is desired to be predominantly pine.

The Windsor, North Carolina, loblolly pine selective logging plots were not reexamined. A hurried visit to the plots, however, showed a quite dense stand of loblolly pine reproduction already established. Most of this reproduction appeared to be overtopped by advanced red maple reproduction. Indications are that an early clearing will be necessary before the pine can be expected to pull through.

Fire damage - Coastal Plain

Work was started on the reexamination of the Lanes, South Carolina, controlled burning plots in longleaf pine but was discontinued for a short period. Reconnaissance of these plots indicates that the accidental fire of December 19, 1931, caused high mortality in the longleaf pine stands which had previously remained unburned for 15 years. The mortality on the annually burned plots appears to be negligible. Analysis of more complete data will throw considerable light on the comparative mortality on the two areas.

Fire Damage Studies

Field records of the 20-acre experimental burning plot were completed and the area prepared for burning early in the month. Plans for a severe fall fire have almost been abandoned because of frequent rains.

Forest Influences

During the early part of the month Hursh surveyed a number of counties in the South Carolina Piedmont where agriculture and labor conditions are contributing to the neglect of rolling agricultural land, most of which requires constant care of terraces when not in complete vegetation cover or under cultivation. The result of the past few years' neglect of this region has been severe gullying which has not been taken care of. In some cases gullies were observed of such magnitude that they were a danger to live stock and in some cases even threatened to undermine roads and public highways. The place of forestry in the rehabilitation of this region is important. Although probably two-thirds or more of the abandoned areas will restock naturally to pine if undisturbed, a considerable portion of the abandoned areas was found to require the construction of mechanical dams or other means of gully control before sufficient loose soil will be accumulated in order to give the tree seedlings an opportunity to become established.

Forest Biology

Burleigh's field activities for the month were divided as follows:

1. Rodent study on Bent Creek.

Trapping of rodents on quarter-acre plots on area to be burned to determine present population per acre, these figures to be correlated with

rodent population immediately after burning and during the following weeks to ascertain the actual effect of the fire. Two typical quarter-acre plots were selected, and on each twenty traps were used. The first, during two weeks of trapping, yielded but three mice; the second, over a period of eight days, but one. These results, similar to those of the past two years, during which more or less intensive trapping has been carried on at Bent Creek, seem to indicate that rodents are a minor factor in so far as silviculture or forest management are concerned.

2. Distribution and life histories of birds and mammals.

Included two field trips, one for five days to Highlands and the adjoining edge of Georgia, and one of four days to Augusta, Georgia. One day was also spent at the top of Mt. Mitchell continuing the faunal study being carried on there.

Forest Insects

Huckenpahler spent the month of November in Washington. He is preparing a progress report to cover all the work on tree injections which has been done to date at Bent Creek. The two main divisions of this experimental work are (1) the control of Dendroctonus frontalis broods in pines by injecting the tree with poisons, and (2) the preservation of the wood of healthy trees against insect and fungi attacks by injecting the growing trees.

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CALIFORNIA FOREST EXPERIMENT STATION

Forest Management - Pine Region

A long field season was brought to a close November 19 when subdivision of the major Mc plots was completed at the Stanislaus Branch. Late arrival of winter storms made possible completion of a heavy field schedule delayed by the Copeland and Public Domain reports, but at the expense of office work. Seasonal growth, soil moisture, and other records were discontinued and the Stanislaus Branch was closed for the winter no November 21.

This year illustrates well the danger in attempting to evaluate the character of growing seasons from general precipitation and temperature records. Despite heavy winter precipitation, conditions were critical throughout the season of growth. No rain of any consequence fell between May and November. By midsummer the soil moisture content had fallen below last season's records, and is still very low at the end of November. None of the mountain roads has yet been closed to travel on account of snow.

Forest Influences (Erosion and Streamflow)

Work of the staff of erosion and streamflow studies was occupied during the month chiefly with putting on finishing touches of all experimental installations in preparation for the winter rainy season. When installations are in readiness each year we hope for an unusually heavy rainy season that

experimental data may accumulate rapidly and decisively. The forecast of rainfall by the California Institute of Oceanography for this season promises less precipitation than fell last rainy season. We are thus brought face to face again with one of the perplexing features of depending on natural rains for experimental results. Our detailed records of rainfall and run-off for about 100 storms demonstrates the wide variability in character of storms. So far we have no record of a "steady rain". Spacing of storms and character of weather of intervening periods introduce a continuous display of variations, of which correlation coefficients seem to be the most satisfactory measure. It is necessary to employ artificial conditions with controlled sprinkling to simulate rain that will isolate variables with satisfaction. The two types of study, however, must proceed hand in hand, so to speak, to facilitate interpretation of data.

The Berkeley installation was put in condition and readiness for the winter rains by Hamilton. Of special interest was the installation of the soil core cutter lysimeters, and the employment of electric welding to unite the walls to the bottom plate by welding each to a steel band. The method worked so well that it is believed to be of value for further use in such installations.

The North Fork installation was put in readiness for the winter rains by Rowe. Of special interest was the installation of four of our improved rain retention pans, which provide for measurement of surficial run-off, erosion, and percolation through 20 inches of soil, one pair being installed in bare condition and one covered with forest litter. The response of these instruments will indicate the approximate effect of given rainy seasons on percolation of water below 20 inches of soil within experimental limitations.

Profile surveys of Juncal reservoir and check dam basins of tributary drainages are being made by Rowe and field assistants from the Santa Barbara National Forest. Delay in fall rains has permitted a satisfactory survey of the area before disturbance by inwash of sediments. This opportunity to follow the sedimentation of a reservoir and check dam basins is unusual and bids fair to yield instructive data.

The Devil Canyon installations were put in readiness by Sinclair and Wilm. Two matters may be of special interest:

1. Run-off tipping buckets at Barranca Burn. Our attempts to measure run-off from Barranca Burn with a weir and later with Parshall flumes have not proved satisfactory because of interference of bed load material in sporadic flows. The test of our 0.5 cubic foot tipping bucket last summer indicated that this instrument will clean itself if boulders too large for openings are not carried along with the current. This instrument is to be given a trial at the Barranca Burn. A wooden dam was built to divert flow through a short 3-foot V flume which empties on a sloping grill to separate large boulders from the storm flow. After the flow passes through the 12 inch Parshall flume it is carried through a 2-foot V flume from which outlets empty into the hoppers of five of the large tipping buckets. These are all connected electrically with a Bristol chart recorder. This installation promises to be noisy during storm flows. Results with this equipment will be of interest to experimenters in streamflow measurements.

2. Y canyon contour trails. Contour trails were built in Y canyon watershed at a contour interval of 1000 feet. Rain gages (10 standard and 2 automatic) were located along the contour trails so as to represent catches of precipitation on ridges on different facing slopes and in the canyon bottoms. A more satisfactory measure of rainfall for the watershed is therefore expected. All streamflow installations are being maintained throughout the winter.

Experimental Forest

Field examination and consultation on the ground with invited consultants in the major watershed study have been conducted. Out-of-state foresters, Raphael Zon, C. L. Forsling, C. G. Bates, C. K. Cooperrider, and Professor Reed Bailey have been invited to serve in a consulting capacity for the watershed study. The field conference is called for December 19 and following days.

Fire Research

Radius of vision

Smoke candles, boughs burned in ash cans, and small plots of pine needles were used in studies carried on earlier in the summer for gathering data on the effective radius of vision from lookout peaks. These more or less artificial means served their purpose and provided valuable and useful information. It became evident, however, that actual fires were necessary to allow the answering of several questions relating to the discovery of fires by lookouts. With this in mind, locations were selected in the pine type where fuel conditions were uniform for all plots to be burned. Each set of plots was chosen within an area directly visible to three lookouts, different directions of sight and different distances being represented.

Some of the questions for which answers are desired are: How large does a fire have to become and how long does it have to burn in directly visible areas before it produces sufficient smoke for discovery by a lookout? Then how long a discovery time should be set up as standard? What is the effect of direction on discovery of smokes? What is the effect of the background against which the smoke rises on the visibility of the smoke? A 4-foot fire line was built around the area in which the fires were to be set, as a safety measure. All small trees were cleared of branches, dead and alive, up to a height of about five feet. A ring six inches wide was cleared of all duff, etc., at the base of each tree within the area to be burned. The last two measures were taken to prevent crowning and to permit quicker extinguishment of the fires after the smoke had been discovered.

From an iron peg, used as the point of origin, stone markers were placed at 5-foot intervals in the cardinal directions. In the direction of the wind the sectors thus laid out were further divided and marked into 45° or 30° sectors for ease in plotting the spread of the fire.

At definitely scheduled times (known to the lookout observers) a match was placed at the iron peg and the fire started. At every two-minute interval the perimeter of the fire was mapped to scale on polar coordinate paper,

thus giving the shape and size of the fire at that time. A five foot measuring stick marked into easily-read one-foot graduations was used by one member of the crew to measure from the nearest marker to the perimeter of the fire in each direction. Rapid work was necessary but the complete measurements could be made in from 20 to 30 seconds. The directions in which the spread was most rapid were measured first.

The fire was allowed to burn unhindered for from fifteen to twenty minutes to build up a volume of smoke well above that required for discovery by lookout observers. In previous work radio communication was used to advantage and very successfully. In these studies the radio sets were not available, with the result that the time schedule system was set up and used.

The wind velocity and humidity were taken during each test. The time when the character of the smoke changed and the time when a good volume of smoke was produced were recorded. Notes on the type of fuel, character of cover, distance and azimuth from given lookout peaks and other relevant data were recorded.

At the end of the fifteen or twenty minute period the fire was totally extinguished with back pack pumps and water so that no smoke remained to confuse the lookout observers at the start of the next fire. From 10 to 15 minutes was required to do this work. The schedule called for one fire each hour, allowing 9 fires to be set each day. Allowing time for controlling and mapping up the fires and preparing for the next run, this interval was satisfactory.

These fires were not to test the alertness of lookouts but for the purpose of finding out the exact moment when the smoke became visible. Therefore, the lookouts were given by mirror flashes the exact location of the spot where the fire was to be started and were told the minute the fires were to be set. This allowed them to observe the first traces of smoke. The observers recorded, by time, the first suspicious haze, the first unmistakeable smoke and the smoke which any lookout should pick up. The azimuth, vertical angle to the smoke, general appearance and behavior of the smoke, the type of background against which the smoke rose were all recorded. On one peak the observer, a member of the Station staff, was provided with a Bennett Casella visibility meter. Observations with the meter were made on the smokes and on selected natural targets shown from previous work to give readings that could be correlated with the atmospheric clarity.

General Observations and Preliminary Conclusions

It was found that for fires in pine needles, under a stand of large poles and in areas directly visible to lookouts that:

1. A fire had to burn from four to eighteen minutes from inception until a sufficient volume of smoke for lookout discovery was built up. The average discovery time for the equivalent of 61 fires was 11 minutes.

2. The size of fires at the time of discovery varied considerably due to background, wind, cover, distance from Lookouts, etc., ranging from 13 square feet to 765 square feet. The majority of the fires were discovered when from 200 to 300 square feet in area. The average size at discovery was 251 square feet.

3. The background against which a smoke rises appears to influence its visibility more than distance.

   (a) At 5 miles one lookout, looking against a sagebrush flat background was unable to detect two fires with certainty and had an average discovery time of 13.1 minutes for the balance of the fires.

   (b) The same lookout viewing smokes at 8-1/2 miles against a timber (dark green) background was able to detect all the test fires with an average discovery time of 6.4 minutes.

   (c) On the other hand, a lookout at 24 miles having a timber background for smokes had an average discovery time of 13.6 minutes as against the lookout at 5 miles with an average discovery time of 13.1 minutes for the same fires. In two instances the lookout at 24 miles discovered identical fires one minute and one and a half minutes before the lookout at 5 miles from the fires.

4. Distance seems to have an effect on discovery time if backgrounds for the smoke are the same. Although additional data must be secured to state positive relationships.

   (a) A lookout viewing three fire plot locations all with green timber backgrounds, at 7-1/2, 10, and 12-1/2 miles respectively. Average discovery times were 6 minutes for the 7-1/2 mile fires, 10-1/2 minutes for the 10 mile fires, and 12.6 minutes for the 12.5 mile fires.

5. It might be expected that smokes would have to become larger to the south and southwest in the afternoon when a lookout has to look into the sun. With natural targets such as trees, rocks, ridges, and cultural features such was found to be the case.

   Data collected on the smokes from actual fires fail to substantiate this idea.

   General observations in connection with other radius of vision studies indicate that the sun shining on a smoke column tends to counteract the decrease in vision due to glare.

Further work along these same lines is planned in order to obtain the mass of data necessary for more positive conclusions.

Forest Products

Woods and Mill Study

One method of building up tree costs and values per M.B.M. from log data was described in the January, 1932, monthly report. The method was satisfactory for obtaining points for the plotting of curves showing average costs and values over d.b.h. but it did not permit an analysis of variations between individual trees.

Since the recalculation by Professor Krueger (member of the University of California Forestry Division, who cooperated in the woods end of the Stanislaus Study) of yarding and log transportation costs by methods giving greater accuracy in the prorating of costs to different log sizes than the method of least squares previously used, it has been necessary to build up a revised set of tree data. In an endeavor to overcome the deficiencies of the building-up process referred to above, several new schemes were tried out, finally resulting in the development of a method which appears to be the final answer to our Region 5 problem of conducting logging-and-milling studies without actually following identical trees all the way from stump to lumber sorting table. The new system consists of the application of data from four simple tables to each individual tree-measurement record made in the woods. The first table shows the curved costs for felling and limbing by tree diameter. The second shows the curved costs per cut for woods bucking by diameter of cross section. The third gives the curved total combined costs per log for yarding, loading, transportation, cold-decking at the mill, and unloading, by gross-scale, woods-log volume. The fourth table shows, for each mill-log volume in each diameter class, (1) the mill tally footage per log, (2) the total plant and overhead costs per log, and (3) the selling value per log.

With one man calling off the figures and another manipulating the keys and levers, a surprisingly large number of trees can be individually summarized in a very short time on a new Dalton adding and listing machine which has been loaned to the Station for trial. After dividing the costs and values per tree thus obtained by the total mill-tally footage per tree, the points are plotted on ordinary cross-section paper.

Curves fitted to these points were practically identical with the curves of average tree values over d.b.h. based on the actual tabulating-machine summations of lumber production from complete trees followed through the mill in the Stanislaus study. There was wide variation between values per M.B.M. of the larger trees due to variation in log grades within a given diameter class. The greatest spread occurred in the 70-inch d.b.h. class of sugar pine trees, the poorest tree being worth $37 per M and the best $48 per M, or a difference of $11.

A statistical check on the sugar pine tree-value curve gave very satisfactory results. Using group averages for plotting and statistical methods of analysis as outlined in the textbook by Exekial, a free-hand curve fitted to a sample of 180 trees showed a standard error of estimate of $2.27, a correlation index of 0.955 and an index of determination of 0.913.

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NORTHEASTERN FOREST EXPERIMENT STATION

In New England the attitude of forestry interests toward the girdling of hardwoods in the spruce region ranges from enthusiastic support to active opposition. This is particularly true in New York where certain forestry factions believe girdling of hardwoods to be wanton destruction. In order to demonstrate the value of girdling in typical spruce stands and also to clarify the objectives of this silviculture measure, Westveld recently laid out a series of plots on the Finch Pruyn Experimental Forest in New York. Cooperators in this experiment are Finch, Pruyn and Company, Cornell University, and the Experiment Station. The girdling work will be carried out under the supervision of an advisory committee of the Empire State Forest Products Association. This committee will consist of New York lumber and pulpwood operators, and on it will be men who favor, as well as men who are opposed to girdling.

During November Stickel completed the final report of the Smyrna Mills, Maine, fire-weather study. In general, the report follows the make-up of the fire-weather bulletin which was published this past summer by the Massachusetts Forestry Association. The manuscript will be submitted to the Maine Forest Service who were cooperators in this investigation for publication in the biennial report of the Forest Commission of that state.

Spaulding's investigation on Cronartium comptoniae (the sweet-fern rust of pitch pines) has been closed with the publication of Circular 217 on this subject. In the study of slash decay, attention is being directed particularly to the factors controlling the moisture and water logging of slash. Further field examination of decay in mature balsam fir was afforded in two quarter-acre plots located at Newcomb, New York. The clearing of trees during the road construction work at the Cale River and Bartlett Experimental Forest presented an opportunity of examining high stumps for decay as indicating the condition of hardwood stands.

In cooperation with A. C. Cline, Harvard Forest, MacAloney has completed two manuscripts on the "Improvement of Weeviled Pine Plantations in New England." One refers to observations on sample plots laid out in 1930 in connection with the "Reclamation of Severely Weeviled Plantations." The other, which is to be published by the Connecticut Forest and Park Association, deals with a reconsideration of direct control methods.

A preliminary compilation of permanent sample plot data shows that although the winter of 1931-32 was very favorable for hibernation and that the actual attack was heavier than in 1931, there was a heavy mortality in the young larval stages. This apparently may be explained by a copious sap flow which drowned the larvae. The result was that from 30 - 45 per cent of the attacked leaders in many plantations have partially or completely recovered.

November marked the close of the field season for the reforestation project. Stewart and Morey, with one assistant during the first half of the month made the fall examinations of the staked lines installed on some of the areas planted last spring by public and private agencies in New

England and New York. About 40 plantations were also examined on the lands of the New Haven and Middletown Water Companies in Connecticut. The rest of the month was devoted to the analysis of the data so far accumulated on the method of planting phase of the project.

Although it is too early to make any conclusions from the data on the staked lines, the results so far obtained may be of interest. Table I summarizes the condition of a Norway pine (Pinus resinosa Solander) plantation planted in April in Massachusetts. This area was picked at random, for analysis has not reached the stage where a typical area might be chosen.

Only 29 per cent of the trees were set normally, while the greater percentage were set various degrees low. The best survival during the first growing season was obtained with trees set at a normal depth. There is little difference in the height growth for any method of setting on this plot. Just how much of an effect any inherent vigor has upon the trees is not known, but it is believed to be a factor at least in the height growth during the first season. These trees all appeared to be in a medium to vigorous condition at the time of setting. The factor of too small a number of trees as a basis is also involved. Future work is expected to throw more light upon the manner of setting as a factor in the success of a plantation.

TABLE I

Condition of Norway Pine Plantation Planted April, 1932 in Massachusetts

Setting[1]	Vigor[2] V	Vigor[2] M	Vigor[2] P	Total survival	Average height growth, inches	Basis,[3] number of trees
	Percentage by setting					
Normal	77	3	10	90	0.23	29
High	50	0	0	50	0.10	2
Low	58	22	6	86	0.24	36
Too low	33	30	7	70	0.21	30
Very low	0	33	0	33	0.20	3
Total	54	19	7	80		100

1/ Normal setting refers to a tree that has been set at the same depth as in the nursery.
High setting means that a tree has been set higher than in the nursery.
Low setting means that a tree has been set lower than in the nursery to a depth not exceeding the first year's growth.
Too low setting means that the tree has been set so low that the first and often the second year's growth are buried.
Very low setting means that the tree was buried to the terminal bud.

2/ V refers to a vigorous tree; M refers to a tree of medium vigor; P refers to a tree of poor vigor.

3/ Since 100 trees were examined, "basis" also shows the percentage of trees set normally or abnormally, thus 29 trees or 29 per cent were set normally.

Ten trees have commenced to develop forks at the ground because of being set too deeply.

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NORTHERN ROCKY MOUNTAIN FOREST & RANGE EXPERIMENT STATION

Silviculture

The major fall activity was the taking of temporary yield plots in even-aged ponderosa pine stands as a part of the inter-station yield study which W. H. Meyer of the Pacific Northwest Station is heading up. In this connection Meyer visited the Station in late October to get acquainted with stand conditions in this region and to coordinate the field methods here with those in other regions.

After a week of scouting young ponderosa pine stands throughout western Montana by Weidman and Meyer, the crew devoted three weeks to taking plot measurements. The work was done in nine localities, including parts of the Bitterroot and Blackfeet drainages, the Flathead Indian Reservation, and the vicinities of Kalispell and Missoula. Some long traveling distances, together with rainy and snowy weather part of the time, prevented as large an output of plots as it had been hoped to get. Altogether, 33 plots were taken in stands approximately 40, 50, 60, 90, and 120 years old. The plots, which were located in fully stocked portions of stands, varied in size from two-tenths to six-tenths of an acre.

Some surprisingly good stand conditions of young even-aged ponderosa pine are to be found in western Montana. An unusually extensive area of 40 to 50-year old stands, aggregating about 5000 acres or more, is located near Frenchtown, 17 miles west of Missoula. This occupies ground which was logged about 40 years ago. The old stumps and a few residual trees indicate the origin of these dense young stands. Here and elsewhere equally dense, 40-year old stands originated by encroachment from old timber on the edges of the larger open valleys like the Bitterroot, Blackfoot, and Flathead. These stands often occupy irregular strips up to a quarter mile wide and hundreds of acres in extent. There are many examples of this occurrence indicating abundant seed crops and exceptionally favorable establishment conditions between 40 and 50 years ago. Younger age classes of similar uniformity of age and density are not readily found. Another age class that is found rather consistently throughout the region is 120 years. Fire and possibly bark beetles have largely destroyed full stocking in these stands, but several excellent examples of good stocking were found. One body of about 10 or 12 acres of 120-year old stand with dominant trees up to 24 inches d.b.h. and 125 feet in height indicates what even-aged ponderosa pine on fairly good site looks like at rotation age. Other age classes that are found at different localities in the region are approximately 60 and 90 years old.

It is planned to take about 20 additional plots next spring to meet the requirement for adequate representation of sites and age classes in western Montana. Fortunately, the 84 plots taken in even-aged ponderosa pine in northern Idaho by Behre will render it unnecessary to do much work in that locality.

Products

Logging and Milling Studies

The last of the field work for the selective logging study conducted in Anaconda Copper Mining Company timber was completed December 3rd. Detailed time studies were made of the entire logging and milling operation from stump to green chain. A total of 215,000 feet net log scale contained in 455 trees, principally ponderosa pine, was included in the study. During the coming winter it is planned to supplement the milling work done to date by a brief study of the yield of mining timbers and plank from the different sized logs when the sawyers are following the regular practice of sawing for timbers, as well as commercial lumber. The sawyers were instructed to saw all study logs for commercial lumber only. The data from this supplemental study should enable us to reconstruct the study logs to show the combined yield of mining timber and commercial lumber.

Excellent cooperation was rendered by the company through every phase of the study. The Bonner sawmill contains three double cutting head rigs which feed commercial lumber to one green chain and two timber transfers. Realizing the difficulty encountered in securing data on these head rigs simultaneously, also timber data, the company shut down one head rig and the timber transfers for the duration of the study. The Chicago, Milwaukee, St. Paul & Pacific Railway Company was also persuaded to run a special train for transporting the study logs after a derailment on the logging railroad had delayed the study logs one day behind the regular train schedule.

Some preliminary work on log grading was done prior to the field work on the A.C.M. study. On the economic selection plot we wished to eliminate as many grade 4 logs as possible. To do this it was necessary to determine what position in the tree they occupied. An analysis of log grades and their position in the different sized trees illustrates the difficulties encountered on building up hypothetical trees from sawmill studies only.

The following table shows that the fifth log in the tree was in all cases a number 4 log. A number 4 log is a log of any size containing 50% or more of number 3 common and poorer lumber. The reverse, however, is not true of butt logs. The percentage of number 1 butt logs varies from 25%for the 16" d.b.h. class to 100% for the 28" and 33" d.b.h. classes. This difference would be very hard, if at all possible, to establish for stands of timber on different sites unless the actual tree study were made.

Log Position in tree	Grade	Diameter Breast High: 16 % By grades	18 % By grades	20 % By grades	22 % By grades	24 % By grades	26 % By grades	28 % By grades	30 % By grades
I.	1	25	72	68	83	78	75	100	100
	2	0	0	0	0	0	12	0	0
	3	42	3	23	7	0	0	0	0
	4	33	25	9	10	22	13	0	0
II.	1	8	3	26	37	11	12	50	100
	2	0	0	0	0	0	25	0	0
	3	67	23	23	44	33	25	0	0
	4	25	9	9	19	56	38	50	0
III.	1	0	0	7	3	0	0	0	0
	2	0	4	0	0	0	0	0	25
	3	20	56	41	35	37	33	0	75
	4	80	40	52	62	63	67	100	0
IV.	1	0	0	0	6	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	33	50	40	25	0	0	0	0
	4	67	50	60	69	100	100	100	100
V.	1			0	0	0	0	0	0
	2			0	0	0	0	0	0
	3			0	0	0	0	0	0
	4			100	100	100	100	100	100

Fire Research

The transportation and man power planning work is developing an ambitious program both in quality and quantity. Although the responsibility for developing planning methods and carrying plans to completion has been assigned to Hornby of the Station staff, the offices of Operation and Engineering have contributed liberally from the beginning. The most recent acquisition of assistance is from the office of Management in providing appraisals of timber values at stake. From the beginning, also, every forest has taken a keen interest in obtaining the results of the planning work, to use them as basis for current improvement developments and to make all developments fit efficiently into the comprehensive improvement plans. Two very large contributions by the forests last season were the completion of seen area maps and of fuel danger maps that show rate of spread and resistance to control. The data obtained from the fire statistical analysis is being put to practical use in weaving the new data into plans.

Plans will be completed this winter for the St. Joe, Coeur d'Alene, and Pend Oreille Forests, and partial plans will be made for the Kaniksu, Kootenai, and Blackfeet Forests. Each forest is providing a man for assistance and to contribute the necessary local information. Since almost every agency in Region One is contributing to this activity, the resultant plans can be expected to have wholehearted support.

Forest Survey

Benewah County offers some interesting type conditions, situated as it is on the meeting ground of the white and ponderosa pine types. White pine crowds in on ponderosa pine and vice versa, and associated species do not seem to know just which way to throw their allegiance, with the result that many of the stands do not conform to any standard type designation. The same condition will exist through Latah County on the south, Kootenai County on the north, and to some extent in Bonner and Boundary Counties, and mappers in these portions of the Region will be called on to use both ingenuity and imagination.

Comparisons show that the private estimates for the two most valuable commercial species, western (Idaho) white pine and ponderosa pine, are very close to the survey estimates. The correction factors for western white pine varied from 0.97 to 1.3 with a weighted average of 1.16. For ponderosa pine the correction factors ran from 0.91 to 1.16 with an average of 1.04.

The survey cruisers obtained more larch timber than all but one of the companies'. The correction factors for this species varied from 0.90 to 1.23 for the five companies. It is interesting to note that the private cruisers obtained more Douglas fir, white fir and cedar than did the survey adjustment cruisers. It was thought generally that with the survey standard set up for these less important species, the company estimate would decidedly underrun the survey estimates. The correction factor for Douglas fir averaged 0.91, for white fir 0.62, and for cedar 0.43. The company cruisers no doubt included a lot of white fir and cedar that was culled by the survey cruisers. To offset the lower estimates for cedar saw logs the survey cruisers (in every case except one) obtained more cedar poles. The survey estimates included 25-foot poles. The correction factor for cedar poles varied from 0.87 to 2.25 with an average of 1.46.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Forest Survey

Andrews, Meyer and Cowlin spent several days in the Bend region of central Oregon testing the working plan for the pine region of eastern Oregon and Washington. Various combinations of types were tried in the selectively cut pine stands to arrive at the combination which would give the necessary data with a minimum of time.

Fire Studies

Early in the month, McArdle and Matthews completed enough field work for the Douglas fir slash disposal study to write the report planned for this winter. Field work on the fire depletion phase (national forest land only) for the Survey also was completed during the month, and a good start made on the large amount of computational work that will be required for completion of the study this winter. The visibility studies were practically completed, at least for this season, during the month. These studies indicate the probable maximum distances at which lookouts can be expected to see the smoke from small fires under various conditions of atmospheric clearness. They show, for example, that the appearance of a light haze on a clear day apparently does not reduce the area of effective detection coverage by an equally small amount. Instead, the reduction appears to be much greater than commonly is supposed. The studies also show the effect on range of visibility from looking toward the sun, the influence of quality of eyesight, size of smoke column, etc. A test was devised to be used in determining quality of eyesight for lookouts. This test seemingly gives better results for lookout purposes than other tests ordinarily in use. A "haze meter" also was designed and tested during the summer. This meter operates independently of quality of eyesight and provides a very simple means of measuring air transparency.

New Public Domain

Principal activity for the month of November consisted of general office work, direction of and assistance in compilation of data, preparing tentative working plans and submission thereof, conferences with public officials, bankers and others concerned with delinquency, conferences with legal representatives of creditors of Port of Astoria, Oregon, who had been sent here by Astoria County officials, released certain data to designated parties for restricted use, cooperated with College of Forestry, University of Washington, in land use and fiscal surveys of Mason County, Washington. (The college is taking data from our delinquency maps and entering same upon a county map on a scale of one inch to the mile, and is gathering other material valuable in intensive studies of the use of abandoned cut-over lands which they agree to release to us.)

Mensuration

Further information on the growth of abnormal stands to a more normal condition is being deduced from the records of the permanent sample plots established in second growth stands of Douglas fir. Only 57 5-year periods are available at the present time, but these will be now increased at the rate of 7 to 8 every year, so that the conclusions will become steadily more and more accurate. On the average the advance in normality is as follows for the various stand values:

Number of trees	+3.2 per cent in 5 years
Basal area	+1.5 " " " " "
Cubic foot volume	+2.3 " " " " "
Board feet Int. rule	+1.5 " " " " "
Board feet Scribner	- .2 " " " " "

With the last three factors there is a definite correlation with degree of normality, being positive for subnormal stands and negative for above normal stands. The plotted average trends are quite distinct, and with increasing number of measurements the computed correlations should become stronger. In certain respects the stands do not stop at a normal condition but tend to balance at some point better than full stocking as defined by the Douglas fir yield tables. A report is being prepared showing the details of these computations.

Silviculture

This year the Douglas fir seed dissemination study was extended to give a measure of seed fall on areas where sample plots are recording the rate of restocking, and also to give an annual measure of seed fall under green timber. Fifty new seed traps were constructed and set in the vicinity of Wind River.

For the first time since the present study has been under way (1927), there was considerable loss of Douglas fir natural reproduction from frost heaving, occurring when heavy rains in early November were followed by a severe frost.

Kolbe examined plots on the Whitman, Malheur and Rogue River Forests. As expected from the poor seed crop of 1931, he found few new seedlings on the reproduction quadrats, generally, less than a hundred per acre. On the other hand, losses in the older seedlings were considerably below that of the past few years on all but one plot where the shoestring fungus and rodents caused much damage to the reproduction.

Douglas fir heredity - Seed from Douglas fir trees representing 29 different combinations of tree types and localities was collected in Region 6 in 1912 to determine what influence the vigor and growing condition of the parent have upon its progeny. The parent trees included old, middle aged, young, densely grown, open grown, defective and sound trees growing on poor soil, good soil, northern and southern exposures, and at high and low altitudes. Various samples were taken from 14 widely distributed localities. The seeds were planted in the nursery and the seedlings were transplanted to 7 plots representing various sites and altitude and latitude conditions. At present each plot has from 50 to 450 progeny representing each type of seed source. Height measurements have been made periodically, and the data are now being analyzed preparatory to the preparation of a progress report. On the best site which is at low altitude near the Oregon Coast, the tallest trees were from 36 to 42 feet in height 16 years after transplanting. On the poorest site, which is at 4600 feet elevation and on a rocky slope in the central Cascades, the tallest trees are 10 to 13 feet in height.

Section of Forest Products

Requests for information both by mail and by personal calls at the office have been more numerous than usual this month. They have ranged from questions on specialized uses of sawmill waste, through shipping weights, to a request to determine the age of sawdust purchased for domestic heating.

Douglas Fir Mill Scale Studies - The loss in oversize sawing in the two mill studies this year has been determined, and a short article submitted to The Timberman.

Forest Survey, Requirements Phase - W. E. Griffee's time expires on December 1. The month has been spent in getting together miscellaneous bits of data. Lodewick has prepared the first draft of a report on requirements for urban dwelling construction in the region, and has begun the report on requirements for private garages. Additional data on non-residential building are at hand awaiting analysis.

Forest Survey, Depletion Phase - Johnson spent the entire month on the cutting depletion phase of the Forest Survey. The segregation of the depletion by counties and character of material for western Oregon and Washington has been completed. A further segregation of the county depletion by species for each item is now being worked out.

The annual cutting depletion for the states by classes of material measured in thousand board feet, log scale, was as follows:

	Logs	Fuelwood	Posts	Pulpwood	Veneer blocks	Shingle bolts	Hewed ties
Oregon	3,072,613	130,800	2,450	14,450	..	..	280
Washington	6,327,007	162,900	1,852	4,487	26,100	10,000	..
	9,399,620	293,700	4,302	18,937	26,100	10,000	280

The total material, other than that of sawlog size, measured in cubic feet, solid wood, amounted to 51,770,940 cubic feet in Oregon and 39,160,510 cubic feet in Washington. This included such items as fuelwood, poles and piling, posts, mine timbers, excelsior bolts, pulpwood and hewed ties.

Forest Insurance

Shepard completed the field work in Washington on November 3. Frost wound up the Oregon portion by completing the Cox Creek Burn near Lakeview (9500 acres) on November 21.

Miss Frisvall went to work on the office computation of the damage estimates on November 17, and since then has devoted all of her time to that work. At the end of the month the computation of merchantable timber estimates had been completed and summary tables were being constructed. Miss Frisvall is now working on the estimates of damage to reproduction.

The field analysis work in the ponderosa pine region of Oregon and Washington, during the past summer, covered a total acreage of 33,375 acres in 32 separate burned areas widely distributed. Of this area 29,729 acres were covered with merchantable timber or reproduction or both.

The field analyses estimate the total gross loss, before salvage, on the areas examined, at 237,140 M.B.F., of which 177,534 M.B.F. was ponderosa pine, the balance being in minor species. On the areas examined 57,007 M.B.F. had been salvaged, leaving a net loss of 180,133 M.B.F. The salvaged timber was 97-1/2 per cent ponderosa pine.

Of the total area of 33,375 acres covered 17,629 acres were in national forests and 15,746 acres were on privately owned lands. There were altogether four 1928 burns, four 1929 burns, four 1930 burns, and twenty 1931 burns. This preponderance of 1931 burns is accounted for by the difficulties encountered in the field in finding older burns which had not been affected by disturbances which obscured the effects of the fires to the extent of making the collection of acceptable data impossible.

Selective Logging

A field trip was made at the beginning of the month by Brandstrom and Mr. Ericson of the Office of Management to the operations of the Western Lumber Company at Oakridge, Oregon. This company is operating in national forest timber (Cascade National Forest) on a long-term sale. The object of the trip was to make a general inspection of the sale area with a view to determining the feasibility of tractor logging for the purpose of intensive tree selection along the lines that were found successful in experiments conducted by the Crown Willamette Paper Company during the last summer. A plan of selective logging compatible with long-view management objectives for this type of timber (which is representative of the Cascade fir type) is now being worked out.

A report on the Crown Willamette Company's selective logging experiments, using tractors and light tractor mounted drum units for yarding, was completed during the early part of the month.

Experimental Forests

Fourteen miles of trail have been completed on the Trout Creek and Panther Creek divisions of the Wind River Experimental Forest and construction work is about to start on the road up Panther Creek that will tap the young growth Douglas fir stand in that division.

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SOUTHERN FOREST EXPERIMENT STATION

Management

An extensive survey was made of the damage caused by the severe fires of the winter and spring of 1932 occasioned by excessive drought for that period. Mortality figures and fire observations were made in North Florida, Southeast Georgia, and Southern South Carolina. The outstanding and conspicuous result of the 1932 fires was the large amount of timber killed in ponds, bays and swamps. During normal years these low places are filled with water and usually support very heavy vegetation. The winter of 1931 and '32 was the dryest on record for the localities studied for over 25 years, according to the Weather Bureau. Many of the swamps burned over two and three times, the last fires burning deep into the soil.

Red Gum Growth and Yield

The influence of standing water on natural regeneration of red gum was clearly shown on one of the sample plots established in a 76-year old stand of red gum in northern Mississippi. This stand developed on an old field which lies between the levee and the Mississippi River. For many years this area has presumably been subject to inundations at each high water period, and sediment has built up the soil level above what it was at the time of the establishment of the stand. Differences in elevation as great as 2 feet are found on this particular half-acre plot. The low areas are practically devoid of all shrubby and herbaceous vegetation as well as reproduction, and the main stand of red gum is conspicuously thinner than on the higher land. In spite of the competition from the dominant gum stand on the higher portions of the area, a dense understory of box elder varying from 4 to 8 feet in height has developed. The line of demarcation between the areas where reproduction and herbaceous vegetation are abundant and the areas where they are entirely lacking is very distinct, and follows the contour, seeming to indicate that the presence of standing water is an important factor in determining natural reproduction of tree species. Some excellent photographs were secured showing this demarcation.

Erosion

Most of the month was spent making annual examinations of the erosion control plantings established in the years 1931 and 1932. Excellent survival was obtained in most cases. Larger grades of stock are giving best results. Also, 1-1 transplants of shortleaf and loblolly pines are proving superior to nursery seedlings for planting on the more adverse sites encountered in the larger gullies. Hole planting is working out more successfully than "dibble" planting.

Insect injury was rather heavy during the past year. Loblolly on every area is infested with tip moth, most of which was harbored in native shortleaf which is also heavily infested. Locust borer damage is heavy and can be traced to infestations on nearby native trees. Only one area (Carroll County, Mississippi) is relatively free from injury.

Financial Aspects of Private Forestry

Preliminary office reports of two intensive "case" studies were completed and sent to the landowners for comments. Data obtained from individual case studies are confidential and will not be published as such. The data from several studies will be amalgamated so as to conceal confidential information.

A plan for studying this phase of forestry by means of permanent plots has recently been adopted. The first of these, a 40-acre plot of second-growth shortleaf-loblolly pine, has been selected in Arkansas. The financial possibilities of present forest conditions can now be obtained, but information on future possibilities under proper forest management is also needed by forest owners. These permanent plots are being selected and put under management by the Financial Aspects staff in cooperation with the forest management group. Such plots will yield information in economics, silviculture, and management.

Forest Survey

The Forest Products Laboratory Selective Logging Study was carried on at Palmetto and LeMoyen, Louisiana. Putnam assisted throughout this study and Foster was assigned to it for several days in order to become better acquainted with hardwood logging and milling practices. An attempt is to be made by the Laboratory to formulate a new set of log grades as a result of this study.

Office work on the analysis of the upland hardwood release unit of Mississippi has been carried on by from 2 to 4 men under the direction of Winters. Stand tables were prepared based on condition and type and these tables were used as a basis for growth calculations.

In preparing cordwood and pulpwood volume tables for the bottomland hardwoods for trees 6 to 12 inches d.b.h., Foster found that the usable cordwood heights ranged from 38 to 56 per cent of the total tree height (cordwood to 4-inch top or where too limby for cordwood). The usable height for pulp on the pulpwood species ranged from 38 to 54 per cent of the cordwood height or about 15 to 40 per cent of the total tree height. The pulpwood volumes in cubic feet were from 30 to 39 per cent lower than the cubic foot volumes available for cordwood. The results of the bottomland data based on actual usable top diameters were consistently 11 to 13 per cent lower than tables based on the Appalachian study where a fixed top diameter was used.

In order to get more detailed information on timberland ownership, utilization, and depletion, Lentz and Foster spent a week visiting all the saw-mills, cooperage plants, box factories, etc., in the region and obtained data from the county tax rolls. Although the upland hardwood at one time produced considerable quantities of lumber, the production in 1932 will be less than 50 to 60 million feet. Mills have shut down, not only on account of the depressed market conditions, but also due to the lack of sizeable timber of merchantable quality. Cooperage plants are picking up stave bolts from small patches of timber, owned chiefly by farmers or planters. No single operating lumber company owns as much as 10,000 acres of timberland in the region. The general practice is to buy stumpage or logs and for the saw-mill operator to keep free of land ownership.

Two crews were inthe field in the pine in northern Mississippi from November 1 to 11, and after that date only one crew carried on. Work is now under way in Lee and Itawamba Counties. Early fall rains have made local roads impassable and have put rivers out of their banks. Nearly all of the merchantable timber has been cut from the bottoms and only culls of such species as beech, magnolia, sweet and black gum, tupelo, and cypress now remain. Blackberry briers have taken over the large openings resulting from the heavy cuttings, but young reproduction is coming in and will eventually shade out the briers.

New Public Domain

In completing the field work for Washington County, Arkansas, a number of things are immediately evident. Much of the land which has reverted to the state for taxes is land that is very distinctly submarginal for any form of

agriculture and some of it is equally submarginal for any form of private forest enterprise. Most of the merchantable timber in this county is gone and the tree growth now occupying most of the forest land is either of inferior species or else scrubby, limby stands of the more valuable species. Fire damage is very heavy as a result of annual burning. Due to the short-boled form occasioned by soil and moisture conditions, and due to cat-facing with subsequent rot in the butt log, even those stands composed of valuable species frequently contain no merchantable timber other than fuelwood.

Shortleaf pines found along the Oklahoma boundary show promise of developing into good stands provided they are protected from fire. Growth is slow and can be attributed principally to fire, for a comparison exists in protected stands on the Ozark National Forest in an adjoining county where growth is much better and reproduction plentiful.

Forest Pathology

Hepting completed an intensive field study of the importance of fire as the cause for understocking of young hardwood stands, through the dropping out of young trees due to decay following scarring. Compilation of the data is to be done this winter in Washington.

Siggers spent most of the month in Florida in an extensive survey of the brown-spot needle blight of longleaf pine. This work has for its purpose determination of the effect of fire as a measure of disease control. This work is to be extended in the near future to Mississippi, Alabama, and Georgia.

Forest Products Pathology

The hardwood lumber dipping test at Picayune, Mississippi, was completed and a log treatment test established at Oakdale, Louisiana.

Preliminary work in the prevention of mold occurrence in finished hardwood staves - a problem of considerable economic importance to the cooperage industry - indicates that the mold can be controlled either by dipping with one of the new compounds, or, where dry kilns are used, possibly by the use of a volatile toxic introduced into the kiln during the drying process. Various compounds are being tried.

Preliminary work on the problem of preventing the objectionable discoloration usually occurring in air-seasoned persimmon blocks, used in the manufacture of golf club heads, indicates that dipping of the freshly sawn stock in one of several chemical solutions may give the necessary control. Apparently the discoloration is caused by an oxidase, probably produced by yeasts or bacteria, whose development may be inhibited by the application of an antiseptic solution.

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SOUTHWESTERN FOREST AND RANGE EXPERIMENT STATION

During Mr. Chapline's visit in October the Jornada management plan was revised. The revised plan permits 1,575 cattle on the mesa division, and 1,800 including the mountain pasture.

A porcupine field conference was held on the Coconino and Tusayan in October. Those participating were Messrs. Redington, Young, Gilchrist, Foster, and Gillham of the Biological Survey, and a representation of forest officers including Randles, Winn, Miller, and Pearson. Trips out from Fort Valley and Flagstaff afforded good opportunities to see examples of porcupine activity and demonstrations of the control work which has been carried on by the Biological Survey for about a year. Incidentally, attention was called to the fact that the Southwestern Experiment Station has pioneered in this war against the porcupine which promises to become nation-wide.

Range Investigations on Coconino Plateau

Completion of the field work for the sixth season has been made on the management of the range study - cutover ponderosa pine type - on the Coconino plateau. Detail records on growth, damage and time of damage have been taken on about 5,000 trees for the six-year period. These trees are on plots scattered over one cattle and one sheep allotment, the plots being in areas of different degrees of grazing use, distances from water, forage type, site, soil and densities of reproduction. Some of the plots are in fenced panels, the use of which is controlled both in intensity and for season, by raising or lowering the fences.

Very heavy concentration of stock of either class usually combined with thirst results in excessive damage, in contrast to a lesser amount of damage, and that practically all in the dry season, on range reasonably used and fairly well watered. In the latter case sheep damage was practically nil. Damage occurs very largely during the dry seasons of the year. It is probably due to a combination of low humidity with consequent low water content of forage, thirst of the stock and extreme succulence of the new pine shoots. Damage to only a reasonable degree and occurring every two or three years has but little or no effect on normal height increment. Recurrent damage season after season may reach a degree that will eventually result in death to the tree.

Forest Mensuration

Lexen has completed the analysis of growth records on representative sample plots in the ponderosa pine type. These plots are all in Forest Service cuttings and the records are for 15 or 20 years. The analysis has brought out clearly the advantage of leaving large residual volumes but, unfortunately, in practice this can seldom be realized due to the lack of sufficient thrifty trees to make up a vigorous growing stock. Residual volumes of 2,000 board feet indicate an average net annual increment of 54 board feet while residual volumes of 5,000 board feet give 112 board feet. It is true that the lower residual volume yields a higher per cent of increment, but with a 60-year cut of virgin timber ahead, is it not most important to cut this over as rapidly as possible, leaving the land in condition to yield the highest possible net increment per acre?

Mortality, as to be expected, is extremely variable. Standard errors computed from the data indicate that it is hopeless to expect to determine mortality with any reasonable degree of accuracy on small units without a high per cent cruise. The average mortality for three five-year periods showed a slight decrease with years after cutting, but when tested for significance by the method of analysis of variance, no appreciable intra-class correlation was found. The data, of course, are not complete enough nor comprehensive enough to conclude definitely that there are no significant differences in mortality with years after cutting, but should such prove to be the case the problem of mortality would be greatly simplified since samples for mortality taken at every five-year period through a cutting cycle would form subsamples of one large homogeneous sample for the entire cycle. This being the case, a sample for mortality could be taken at any period of the cutting cycle, and if made large enough would give a reliable estimate of the annual loss due to this one factor.

Experimental Forest

Approximately one section of the Fort Valley Experimental Forest has been covered with 100 one-acre permanently located plots spaced equal distances apart. These have been established preparatory to experimental cuttings which are to begin as soon as market conditions make it possible to dispose of the logs. It is hoped that the distribution of small plots will give a better sample of the conditions over the Experimental Forest as a whole than the larger intensive plots have done on other areas heretofore. The initial labor of establishing these plots is considerable, but the statistical advantage of doing so is expected to more than off-set this preliminary work.

The distance between plots has not at present been based on any statistical measure, and it may be found necessary to lay out additional plots in order to secure a reliable sample of the forest as a whole. Since the plots are to be used to sample several factors it is natural to expect that what is sufficient for one determination may be more or less than what is needed for another.

Reproduction of Douglas Fir

An intensive study of factors influencing reproduction of Douglas fir is being conducted by Krauch on the Lincoln. Observations over a number of years had indicated that shade, litter, rodents and livestock were among the important factors susceptible of control. In order to eliminate seed supply as a variable, artificial seeding was employed. Meter square plots in three series were sown in June at the rate of 400 seeds per plot. One series was fenced against livestock, one against livestock and rodents, and a third unprotected. In each series, shade effects of 30, and 50 per cent were obtained by means of lath frames; open plots were estimated to be about 15 per cent shaded. Some of the plots were covered with needle litter and others left natural. Copious rains began in the latter part of June and continued through July and August.

Seedling counts were made August 15, September 11 and October 13. The August counts gave an average of 90 seedlings per plot on the plots protected against rodents and cattle, no shade and no litter. Corresponding plots protected only against cattle or wholly unprotected averaged 4.9 seedlings, and the wholly unprotected plots 6.0. These results point to rodents, consisting of mice and chipmunks, as an overwhelming factor. Much of the damage was done by biting off the seedlings after germination. Cattle apparently were not an adverse factor.

In the rodent protected shade series the open plots (15 per cent shade) gave 114 seedlings, 30 per cent shade 34 seedlings, and 50 per cent shade 8 seedlings per plot. These results are difficult to explain in view of the fact that Douglas fir in the early stages usually responds well to moderate shade. Moreover, a similar series in which all plots were covered with ponderosa pine litter gave more seedlings in the shaded than in the unshaded plots.

Unprotected plots covered with litter generally contained more seedlings than those on which no litter was placed. Since litter had the opposite effect where rodents were excluded, it would appear that the presence of litter interfered to some extent with rodent activity.

Survival at the close of the growing season, October, was generally high, ranging from 84 per cent on the rodent protected plots to 40 per cent on the unprotected plots. Examinations late in November still showed no great losses. Winter and spring conditions are believed to be the most critical ones.

Summer and Spring Production on the Santa Rita Experimental Range

It is a well known fact that the average stockman places considerable dependence upon spring growth to carry his cattle through the year and into the next summer growing season. Without question, there is a definite basis for this on certain types of range; however, on strictly grass ranges we have not, despite the stockmen's opinions, felt that spring growth on the average was much of a factor, and in order to substantiate our observations, established (in 1930) a series of yearlong clipping quadrats with the definite purpose in mind of determining the relative amount of the year's perennial grass growth that was produced during the summer and spring growing seasons. Perennial grasses were actually clipped and weighed while spring and summer weeds were only counted and not considered in the compilation since there were only a very small proportion that could be classed as forage for any kind of stock.

The following table presents the results of the two years' data that have been collected so far, and shows the per cent of the total year's growth that was produced in each of the summer and spring growing seasons:

Mesa Type

	No. of plot	1930-31 Summer	1930-31 Spring	1931-32 Summer	1931-32 Spring	Average Summer	Average Spring
Protected since 1926	9	93.99	6.01	95.09	4.91	94.57	5.43
" " "	10	92.95	7.05	95.45	4.55	94.12	5.88
" " 1927	1	97.05	2.95	97.48	2.52	97.24	2.76
" " "	2	95.56	4.44	96.48	3.52	96.02	3.98
" " 1929	3	94.63	5.37	97.37	2.63	96.35	3.65
" " "	4	93.60	6.40	95.23	4.77	94.58	5.42
Average		94.88	5.12	96.23	3.77	95.56	4.44

Foothill Type

	No. of plot	1930-31 Summer	1930-31 Spring	1931-32 Summer	1931-32 Spring	Average Summer	Average Spring
Protected since 1926	5	87.22	12.78	93.65	6.35	91.21	8.79
" " "	6	89.59	10.41	94.55	5.45	92.44	7.56
" " 1929	7	88.91	11.09	95.62	4.38	93.06	6.94
" " "	8	86.89	13.11	94.19	5.91	91.03	8.97
Average		88.19	11.81	94.47	5.53	91.91	8.09

It will be noted that areas representing various periods of protection from grazing were selected in an effort to overcome any unusual conditions that might have been prevalent in any one area either at the time it was fenced or later. In the mesa type the area under protection for the greatest length of time appears to yield a slightly higher per cent of spring growth while in the foothill type there is no apparent difference. Whether or not there is any significance attached to the period of protection - in the mesa type - is somewhat doubtful in view of the relatively high percentage of spring growth on the areas protected for the shortest length of time. It appears more likely from these data as well as from previous observations that condition of the range along with rainfall conditions at the time of fencing are the controlling factors.

The relative percentages of spring and summer growth on all the areas are sufficiently consistent to be considered conclusive for the years in question. When it is considered that the spring seasons of both these years, and particularly that of 1930-31, were rather above the average, the results become still more striking and show very definitely that spring growth of perennial grasses can not be counted on materially but should be considered as a reserve supply only. The two-year average for spring growth would indicate a supply of forage lasting about two weeks in the mesa type and slightly under a month in the foothill type. With a few of the poorer spring seasons mixed in it becomes apparent that the spring forage growth can not be counted on for a considerable part of the year's feed.

The relatively higher per cent of spring growth in the foothill type indicates to some extent the more permanent nature of the species in this type of range as well as the difference that the slightly higher rainfall of the foothill type may make, during a period of generally low moisture.

Soils in the Parker Creek Region

The Parker Creek Experimental Forest is located on the south slope of the Sierra Ancha Mountains in central Arizona; and is situated in an area

that is interesting ecologically, because of its widely varied vegetation. Natural factors influencing the diversity of vegetation are climate, soil, altitude, slope, and exposure. The region has also been disturbed by grazing, erosion, and fire. Total annual rainfall indicates a chaparral vegetation while the distribution of the precipitation seems favorable to both grasses and shrubs. This indicates a shrub savannah as climatically the most important community.

According to notes by Whitfield the two important soil types, quartzite and diabase, support two definitely different vegetative types. Chemically the soils are quite uniform; analyses show them to have low organic, soluble salt, and nitrogen content, and to be basic and alkaline. Physical characteristics of the soils are in sharp contrast, as shown by soil moisture and wilting coefficient data (Table I).

Table I. Soil Moisture Data on Quartzite and Diabase After One Inch of Rain

	Surface	Six inches	Wilting coefficient (approx. 1"-6")
	August 26, 1932		
Quartzite	10.3	9.2	
Diabase	5.5	7.4	
	August 29, 1932		
Quartzite	4.2	13.0	7.3
Diabase	1.5	5.1	2.0
	September 14, 1932		
Quartzite	1.5	6.2	
Diabase	.9	2.0	

Other experiments tend to bear out these results of a physical difference between the looser, lighter diabase soils and the quartzite. This water relation may be helpful in explaining the present of curly mesquite and the greater abundance of other grasses on the quartzite soils. From a study of remnants, Cooperrider believes that at one time both diabase and quartzite had good stands of grama grass; the diabase lost its stand first, since disturbances by grazing tend naturally to break down the looser soils more quickly.

That the diversity of vegetation on the two types of soil is probably physical, or a water relation, is further shown by the fact that some species, for instance the turbinella oak, which is commonly found on the diabase, appears frequently in the more favorable quartzite areas.

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On the fifteenth, the 1932 ponderosa pine source of seed plantation at the Monument Nursery, whose purpose is to study the relative development of various altitudinal strains in a low-elevation plantation, was examined. This plantation was hard hit by drouth during the past season and the final survival for the year was only 50.6%. In all likelihood, the plantation would have failed completely, but for the artificial watering given it on two occasions during mid-summer.

In the following tabulation, the first year results for this plantation are shown; also the comparable results obtained in the high elevation plantation of the same series. The latter plantation lies at 9,175 feet; the low-elevation plantation, at 7,225 feet above mean sea level.

Elev. of parent trees	No. of parent trees represented	No. of 2-2 trees planted		Percentage survival		Percentage of trees making actual growth	
		Low elev.	High elev.	Low elev.	High elev.	Low elev.	High elev.
7000'	3	195	198	37.9	71.7	25.6	27.3
7150'	1	106	106	40.6	74.4	26.4	46.2
7300'	1	106	107	41.5	77.6	36.8	49.5
8850'	2	202	200	57.9	79.5	45.5	61.5
9000'	1	106	108	79.2	84.3	69.8	62.0

From the standpoint both of survival and percentage of trees making actual growth during the season, in spite of exceptionally dry weather, the performance of the progeny from the high elevation parent trees surpassed that of the low elevation progeny in both plantations. The interval in survival percentage between the low elevation and the high elevation stock was much less, however, in the upper plantation; the difference amounting to 13% as against 41% in the lower plantation. This result is rather surprising. It is believed, however, that the variation in response is due more to abnormal weather conditions and that it does not represent a normal growth reaction. This appears to be substantiated by the small percentage of trees which increased their size through the elongation of their branch and stem terminals. In the stock originating at the lowest elevation, approximately one tree in four only made any new growth, while the ratio for the high elevation was approximately two in three. The response in the lots representing the extremes in elevation was about the same in the two plantations, but the performance of the intermediate lots was appreciably better under the somewhat less severe climatic conditions which prevailed in the high elevation plantation. So far as ability of establishment is concerned, greater size, even when associated with longer root structure which should provide a definite advantage where moisture conditions are limiting, appears to be a handicap.

The Douglas fir thinning plots, of which there are four in the sapling Christmas tree stands in Jarre Canyon (near Denver) on the Pike Forest, were remeasured with the assistance of members of the Pike staff during the

latter part of the month. A ten-year record of growth will be available for these plots, which were established in 1921-22, when the data are compiled. Maximum diameter increases of 1.3" in five years were recorded under a condition of heavy thinning. The inhibitive effect of closer spacing is becoming most evident in the intermediate and overtopped trees. Much less difference is apparent in the average periodic increases in the dominant class under various densities of stocking, ranging from approximately 500 to 2600 trees per acre (including the unthinned check plot).

The unidentified pitch girdle disease is still much in evidence, especially on the unthinned plot. The losses, due to its activity, were much more numerous on this plot than on the combined area of the thinned plots, and the same is true for new infections. In the absence of any specific knowledge of the disease, it is apparent that thinning constitutes the best weapon at hand in controlling the occurrence and the spread of this disease.

During the latter days of the month, Roeser attended the annual meeting of the Colorado-Wyoming Academy of Science at Fort Collins (November 25 and 26) and read a paper on "Some aspects of Cone Production and Development in Ponderosa Pine" before the Plant Science Section. This paper dealt with the more specific phase of the ponderosa pine seed production study to obtain information upon the chronological rate of cone development and also upon the rate and periodicity of mortality in the cone crops of this species and the probable causes.

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Abell, Margaret S.	Much Heart Rot Enters White Oaks Through Fire Wounds. (Forest Worker, Nov. 1932).
Demmon, E. L.	The Forest Service and the Naval Stores Industry. (Naval Stores Rev. Nov. 26, 1932).
Hough, A. F.	Some Diameter Distributions in Forest Stands of Northwestern Pennsylvania (Jour. For. Dec. 1932).
Laxton, Josephine	Lady Samaritan of the Christmas Greens. (American Forests, Dec. 1932).
Lodewick, J. Elton	Sawmill Waste and Its Utilization in Scandinavia and the Pacific Northwest. (Journal of Forestry, Nov. 1932).
Nelson, R. M.	Growth and Mortality of Chestnut Sprouts (Jour. For., Nov. 1932).
Roeser, Jacob Jr.	Thinning Jack Pine in the Nebraska Sand Hills (Jour. For., Dec. 1932).

MANUSCRIPTS

Appalachian

"Increased Growth of Loblolly Pines Left After Partial Cutting." By A. L. MacKinney (For Jour. Agr. Res.)

Lake States

"Possibilities of Release Cuttings in Minnesota Forests." By F. H. Eyre (For Jour. For.)

Pacific Northwest

"Loss in Oversize Sawing of Douglas Fir Lumber in Two Willamette Valley Mills." By J. Elton Lodewick. (Submitted to the Timberman).